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APPENDIX A

THE LOGISTIC SUPPLY OF VC/PAVN FORCES

A. Daily Supply Requirements

VC/PAVN combat forces in South Vietnam were estimated on 24 February 1966 at approximately 72,500 men, including 12,500 PAVN, 43,000 VC in the main force, and about 17,000 VC in separate companies and platoons in the local forces. Only the 55,500 troops (111 battalion equivalents of 500 men each) of the main force are believed to receive significant logistical support from external sources. Therefore, the logistic requirements for both external and internal support discussed in this study pertain only to the 111 VC/PAVN main force battalions. The logistic impact of the introduction of 120-mm mortars into main force units and the use of PAVN antiaircraft artillery units in South Vietnam is not considered in detail in the following discussion. Taking such factors into consideration would require field reporting on ordnance expenditure which is not yet available.

The logistic requirements for three possible situations are considered:

(1) the present level of the main force and the present level of combat, in which each battalion is assumed to fight about once in every 35 days; (2) the present level of the main force and escalated combat in which each battalion is assumed to fight once in every 7 days; and (3) the main force increased to 155 battalions each of which is engaged in combat once in every 3 days. The level of combat under the first situation is that prevailing during most of 1965. Under each situation a battalion is assumed to expend one-third of its basic load of

ammunition during each day of combat. The estimated basic load of ammunition of a VC infantry battalion is 7.9 tons. The weapons of the battalion include rifles, carbines, light machine gun/assault guns, 12.7 mm machine guns, 57 mm recoilless rifles, 40 mm rocket launchers, 60/61 mm mortars, and 81/82 mm mortars. Of the total basic load of 7.9 tons of ammunition, more than 4.9 tons are required for the 12.7 mm machine guns. The remaining 3 tons are fairly well distributed among the other weapons organic to the battalion. The number of rounds per weapon varies from 5 for each rocket launcher and 40 for each rifle and carbine to 1,760 for each 12.7 mm machine gun and 2,160 for each light machine gun. This does not seem to be a particularly generous ammunition allowance.

Daily logistic requirements for the VC/PAVN main force battalions under the various assumptions listed above are summarized in the following tables:

Table 1

Logistical Support for the Current Communist Main Force a/
in South Vietnam Under the Current Scale of Combat b/

<u>Class of Supply</u>	<u>Tons Per Day</u>		
	<u>Requirements Supplied From Sources Within South Vietnam</u>	<u>Requirements Supplied From Sources Outside of South Vietnam</u>	<u>Total Requirements</u>
Class I (Food)	55.5 c/	Negl.	55.5
Class II (Quartermaster) and Class IV (Weapons)	1.6 d/	3.7	5.3
Class III (POL)	1.4	Negl.	1.4
Class V (Ammunition)	Negl.	8.3	8.3
Total	58.5 e/	12.0	70.5

- a. III battalions (86 VC, 25 PAVN) of 500 men each.
b. Each battalion is engaged in combat once in every 35 days.
c. Calculated on the basis of 2 pounds of food per man per day, known from captured documents to be VC/PAVN planning figure.
d. Quartermaster supplies only.
e. The 17,000 VC in the local forces require an additional 20.5 tons of logistic support from sources within South Vietnam. These local forces are assumed to be self supporting and to obtain all their requirements for food, quartermaster supplies, weapons, and ammunition from indigenous sources. Although most of these troops are not equipped with the new family of 7.62 mm weapons, there have been indications that some units are beginning to be so equipped. If this is the case the requirement for these forces would be increased slightly and they would have to depend to some extent on logistic support from external sources.

Table 2

Logistical Support for the Current Communist Main Force a/
in South Vietnam Under an Escalated Scale of Combat b/

Class of Supply	Tons Per Day		
	Requirements Supplied From Sources Within South Vietnam	Requirements Supplied From Sources Outside of South Vietnam	Total Requirements
Class I (Food)	55.5 c/	Negl.	55.5
Class II (Quartermaster) and Class IV (Weapons)	2.8 d/	23.0	25.8
Class III (POL)	1.4	Negl.	1.4
Class V (Ammunition)	Negl.	41.7	41.7
Total	59.7 e/	64.7	124.4

- a. 111 battalions (86 VC, 25 PAVN) of 500 men each.
b. Each battalion is engaged in combat once in every 7 days.
c. Calculated on the basis of 2 pounds of food per man per day.
d. Quartermaster supplies only.
e. The 17,000 VC in the local forces require an additional 31.3 tons of logistic support from sources within South Vietnam.

Table 3

Logistical Support for an Expanded Communist Main Force a/
in South Vietnam Under an Escalated Scale of Combat b/

Class of Supply	Tons Per Day		
	Requirements Supplied From Sources Within South Vietnam	Requirements Supplied From Sources Outside of South Vietnam	Total Requirements
Class I (Food)	77.5 c/	Negl.	77.5
Class II (Quartermaster) and Class IV (Weapons)	5.5 d/	35.6	41.1
Class III (POL)	1.9	Negl.	1.9
Class V (Ammunition)	Negl.	135.9	135.9
Total	84.9 e/	171.5	256.4

- a. 155 battalions (116 VC, 39 PAVN) of 500 men each.
b. Each battalion is engaged in combat once in every 3 days.
c. Calculated on the basis of 2 pounds of food per man per day.
d. Quartermaster supplies only.
e. The 17,000 VC in the local forces require an additional 48.8 tons of logistic support from sources within South Vietnam.

The total requirement for logistic support for the VC/PAVN main force under the present level of fighting is estimated to be about 70 tons per day, with somewhat less than 60 tons required from sources within South Vietnam and about 12 tons or 17 percent of the total required from external sources. The internal requirement is made up primarily of food and the external requirement primarily of weapons and ammunition. If the force level remains the same, but the level of fighting escalates to once in seven days, the total logistic requirement increases to about 125 tons per day with about 60 tons required from internal sources and nearly 65 tons or more than 50 percent of the total from external sources. A buildup of VC/PAVN forces to 155 battalions and an increase in the level of fighting to once in every three days would bring about a substantial increase in dependence on external sources for logistic support. Under these circumstances the total requirement would increase to more than 255 tons per day with about 85 tons required from internal sources and more than 170 tons or two-thirds of the total from external sources. Even if the present scale of fighting and the present force do not increase significantly, there are indications that the requirement for external logistic support will increase gradually during 1966, because of the introduction of heavy mortars in main force units and the limited use of PAVN antiaircraft artillery units. Under these circumstances the logistic requirement for the present force might increase to more than 12 tons per day. The 12 tons per day is based essentially on the experience of 1965, but if our assumptions about ammunition expenditure for heavy weapons change,

this figure might double. The following tabulation summarizes in rounded form the total requirements figures under the various assumptions discussed above:

	<u>Internal Requirement</u>		<u>External Requirement</u>		<u>Total Requirement</u>
	<u>Tons Per Day</u>	<u>Percent</u>	<u>Tons Per Day</u>	<u>Percent</u>	<u>Tons Per Day</u>
111 battalions (current level of combat)	58	83	12	17	70
111 battalions (combat once in 7 days)	60	48	65	50	125
155 battalions (combat once in 3 days)	85	33	171	67	256

B. Effect of a Denial of Supplies from Sources Within South Vietnam

A complete denial of supplies from sources within South Vietnam is difficult to imagine, but if it were to occur the Communists would essentially be required to ship into the country substantial tonnages of food each day in addition to the large amounts of weapons and ammunition already required. Quartermaster supplies and POL would present few problems because the amounts required would be relatively small. On an annual basis the additional food required would range from about 20,000 to 28,000 tons, under the three cases considered above. These tonnages are not large in comparison to the annual availability of rice in North Vietnam, amounting to less than one percent of the total. Thus it seems feasible to assume that the North Vietnamese could make available the additional food required. Moving the food to South Vietnam on a sustained and predictable basis, however, might be another matter, although the total logistic support required even under the most extensive scale of combat presented above is still within the estimated capacity of the overland supply route through Laos.

C. Route Capacities

1. Land

The overland movement of the required tonnages from North Vietnam to the border of South Vietnam is restricted by the capacity of the routes in the Laotian Panhandle rather than by the capacity of the routes in the southern part of North Vietnam. Even route 15/^{the} key route leading to Mu Gia Pass, has an estimated present dry season capacity of 450 tons per day, reduced from 600 tons per day in April 1965 as a result of the US/GVN air attacks. The capacity of route 102 leading to the Laos border north of the Demarcation Line is presently 100 tons per day. Over these two roads alone at least 550 tons per day can presently be delivered to the Laotian border.

Present road capacities within Laos are such that 450 tons delivered to Mu Gia Pass can be moved over routes 12, 23, 911, and 9 to Ban Dong where route 92 joins route 9. An additional 100 tons can be delivered to Ban Dong around the end of the Demilitarized Zone (DMZ) from the end of route 102. Thus the Communists can presently deliver 550 tons daily to Ban Dong at the junction of routes 9 and 92. From this point 400 tons per day can be moved south on route 92 to the junction with route 922 over which 200 tons per day can be moved toward the South Vietnamese border. Before reaching this point 50 tons per day can be diverted over route 921 also toward the South Vietnamese border. The remaining 150 tons can be moved further south on a segment of route 92 with a capacity of 150 tons per day and then over routes 923, 96, and 165 to the border of South

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Vietnam. Thus the present throughput capacity of the routes in the Laotian Panhandle appears to be about 400 tons per day. However, because of the conservative nature of the [] methodology used for computing the above road capacities it is quite possible that more than 400 tons per day can be delivered on a sustained basis to within a few miles of the South Vietnamese border if the Communists make an all out effort.

It is expected that new access routes from North Vietnam and Laos into South Vietnam will be constructed in 1966. These routes will enhance the infiltration throughput capability by providing a more diverse choice of routes. A new road was observed under construction in late January in a northeasterly direction from route 911. This road may eventually become another border crossing between North Vietnam and Laos south of Mu Gia Pass. Further south road construction has been underway between Chavane on route 165 and route 16 east of Attapeu. Recent track activity indicates that the work may have been completed, thus providing about 50 miles of motorable road further south on the supply route. Photography of late January and early February also indicated that clearing operations were being conducted at a rapid rate southeast of route 16. If this work continued at the same rate as in early February, a road would have been open to the Cambodian border in the tri-border area (Cambodia, Laos, and South Vietnam) by the last week in February. The improvement of a route into this area is another indicator of the increased activity in the Laotian Panhandle in support of Communist supply movements to South Vietnam.

Considering the present and projected level of construction and interdiction in the Panhandle it is estimated that the practical throughput capacity of the Laotian routes will be in the range of 400 to 700 tons at the end of 1966 and that the Communists will be able to sustain a movement of at least 400 tons per day to the end of route 165 or further south to route 16 and beyond if they so desire. On an all weather basis the Communists are presently able to move about 100 tons per day toward the border of South Vietnam, 50 tons at the end of route 922, and 50 tons at the end of route 165. If it is assumed that 400 tons per day can be moved forward during the 180-day dry season and 100 tons per day during the 180-day rainy season, an average of 250 tons per day can be moved forward on an annual basis.

It should be pointed out that these road capacity estimates are for sustained movements of at least 90 days duration, and that they make no provision for crash movements or various field expedients that the Communists have often employed in the past. For example, when short term operational moves of 3 or 4 days are considered the road capacity may be doubled or even tripled. In general it should be kept in mind that road capacity estimates tend to err on the low side and that all the capacity figures previously cited are at best only very rough approximations of the utilization which the Communists can make of the cited routes.

Inland waterways have been used to supplement some sections of the road network both in North Vietnam and in Laos. Only one waterway in Laos, the

Se Kong River, is known to be used to any extent as part of an infiltration route, although the alignment of other waterways, the Se Bang Hieng, the Se Pone, and the Song Ben Hai, makes them suspect infiltration routes. Aerial photography of the Se Kong between the southern end of route 92 and the point where route 165 leaves the river has revealed waterway improvements, native craft on the river, and portages of difficult sections. This waterway is navigable by canoes throughout the year, but its use during the dry season has probably been reduced since the completion of parallel route 96. The Song Ben Hai/Rao Thanh waterway in the DMZ forms the border between North and South Vietnam. Although infiltration of personnel across this river has been reported, infiltration of supplies has not been observed. Use by canoes of this waterway throughout the year for lateral movement within the DMZ to interior tracks, trails, and tributary streams providing access to South Vietnam is possible, however. Estimates of the capacity of these various waterways are extremely tenuous, ranging generally from 25 to 50 tons per day during the dry season to 50 to 500 tons per day during the rainy season. At best the inland waterways can be used to supplement portions of the road network but cannot be used for through movements.

In general, it may be concluded that the current and projected dry season capacity of the route system through Laos is much more than adequate to provide for the amount of tonnage required by Communist main force units in South Vietnam, even if the level of these forces increases by nearly 40 percent and the intensity of combat reaches a scale of more than 10 times its present level.

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2. Sea

The capacity of the sea infiltration routes from North Vietnam to South Vietnam cannot be quantified with even as much precision as the land route through Laos. Although sea infiltration has provided an important means of supply to the Viet Cong in the past, the sporadic nature of sea movements, the infrequency of detection, and the small number of voyages by any given craft in the course of a year, make it very difficult to establish even a theoretical order of magnitude for shipments by sea, let alone the amounts actually moving.

We believe that ^{the level of} ~~little~~ sea infiltration is ~~currently taking~~ ^{has been drastically reduced since the inception} ~~place between North and South Vietnam. Since early 1965 no craft attempting to~~ ^{of the US Market Time operation in 1965. Since that time no craft identified as} ~~infiltrate supplies into South Vietnam by sea have been picked up, although some~~ ^{infiltrating supplies into South Vietnam by sea have been picked up.} ~~craft engaged in internal redistribution of supplies have been stopped.~~ Because of the magnitude of the US Market Time operation it is probable that some infiltrating vessels would have been intercepted if the North Vietnamese were making a concerted effort to move supplies in this manner. As of November 1965 it was estimated with 95 percent confidence that under the current scope of the Market Time operation only one infiltration craft could escape detection each day and 14 craft each night. If 15 small craft were actually able to get through the blockade during each 24-hour period and each craft carried about 4 tons of supplies each trip, then 60 tons could be delivered on a daily basis. With each craft making one trip a month between North Vietnam and South Vietnam, about 450 craft would be involved. Steel-hulled ships or the larger junks used for

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infiltration could carry 50 to 100 tons per trip. Even an occasional successful delivery by a ship of this type would add substantially to the amount of material being infiltrated. If the Communists made a determined and concerted effort to infiltrate supplies by sea, however, they would have to be willing to run the risk of experiencing substantial losses.

It can be concluded that the capacity of the sea route in the short term is essentially whatever the Communists want to make it. Over the long haul, however, this capacity is limited by the number of craft and trained crews available, and by the costs the Communists are willing to pay in terms of craft sunk, crews captured and killed, and supplies lost during infiltration attempts. Our Market Time operation has increased this potential cost immensely and probably will continue to discourage the Communists from making any serious attempts at large-scale sea infiltration as long as sufficient amounts of supplies can be moved south on the land route through Laos and lesser amounts can be moved along land or sea routes from Cambodia.

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3. Cambodia

If the Cambodian government were to permit the use of its territory to support Communist military activities in South Vietnam, the Communists would be able to develop a major and secure supply system into the delta area of South Vietnam. This supply system would have the capacity to move the additional 1,200 tons of military supplies which it is estimated could be handled daily by the port of Sihanoukville. During 1964, this port handled about 800,000 tons of which 220,000 tons were imports. Considering normal port operations only, it is estimated that the port could handle additional imports of at least 450,000 tons per year, or an average of about 1,200 tons per day. This figure could be increased by intensified operation. In addition to the major port of Sihanoukville, Cambodia has three minor ports which are used mostly for fishing and naval activities. A small additional amount of tonnage could be delivered at

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these ports, but only one of them can accommodate small oceangoing ships.

Clearance from Sihanoukville and the minor ports would be mainly by road transport, although coastal water transport using small ~~craft~~^{craft} would also be available.

A railroad from Sihanoukville to Phnom Penh has been under construction for about five years, but a number of major bridges and most of the tracklaying on the 160-mile route remain to be completed. Cambodia is estimated to possess about 10,000 trucks, and more could easily be imported.

The roads leading out of Sihanoukville have a greater capacity than the port itself and could easily handle 1,200 tons of military supplies for shipment to South Vietnam. Two roads could be used to clear Sihanoukville: (1) the Sihanoukville-Phnom Penh American Friendship highway, and (2) the coastal route direct to South Vietnam. The direct impact of the use of these routes would be almost wholly in the southern part of South Vietnam, particularly in the Mekong delta region.

The 145-mile Sihanoukville-Phnom Penh American Friendship highway, route 4, with a capacity of ^{7,000}~~3,150~~ tons per day in the dry season and ^{6,300}~~4,350~~ tons per day in the rainy season, is the major route available to clear the port. From Phnom Penh, supplies could be moved by either highway or inland waterway to the South Vietnamese border. The best route, however, is highway route 1, which leads to the area facing Tay Ninh Province. Route 1 has a capacity of 3,600 tons per day in the dry season and 1,550 tons per day in the rainy season. The movement of 1,200 tons daily from Sihanoukville to the border on this route

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about 3,000 trucks.
 would require ~~from 1,500 to 2,000 trucks~~ (assuming that each truck carried 3-5
~~tons~~). There are also two routes that extend north from the Phanom Penh area and
 connect with route 7, which approaches the northern border of Tay Ninh Province.
 These routes have lower capacities than route 1, especially in the rainy season,
 and the distance to the border is greater. From Phanom Penh, two slightly shorter
 routes extend to the border of Kien Giang and Chau Doc provinces. At least 1,200
 tons per day could be moved over these two routes throughout the year. The
 coastal road from Sihanoukville has a dry-weather capacity of *slightly less than* ~~over~~ 1,000 tons per
 day and is the shortest route to the border, only 115 miles. In the rainy season,
 however, its capacity drops to ¹³⁰ ~~150~~ tons per day.

The major inland waterway is the Mekong River system, which has a
 capacity to move at least 6,000 tons per day south to the border from Phanom Penh
 with craft readily available. This capacity could be increased during the high
 water season. Supplies could also be moved north to Stung Treng on the Mekong
 or on parallel route 13 which now is estimated to have a capacity of 3,650 tons
 per day in the dry season and 1,570 tons per day in the rainy season. From
 Stung Treng supplies could be moved on route 19, on trails, or on minor waterways
 to VC/PAVN forces in Kontum and Pleiku provinces. At one time it was believed
 that this was a difficult route with less capacity than the Lao corridor, but
 route 19 is now estimated to have a capacity of 700 tons per day in the dry sea-
 son and 250 tons per day in the rainy season.

The capacities of the various routes mentioned above are expected to

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remain at approximately the same level at the end of 1966. Although goods could be moved to border crossing points on these routes, the South Vietnamese government has check points at the border crossings of each of the major routes, with the exception of route 1, so supplies would have to be dispersed at some point before the border was reached and moved on local roads, trails, and waterways. The border crossing point on route 1, however, is apparently under Viet Cong control, with the nearest known South Vietnamese military units located about 15 miles to the northeast.

It can be concluded that with sufficient trucks and drivers available, and in the absence of air interdiction, the total volume of supplies which could be cleared through the port of Sihanoukville could be moved forward to the South Vietnamese border over the main routes. In addition, supplies brought in through lesser ports along the Gulf of Siam could be moved by coastal and inland water routes and over trails to the border area.

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D. Options for Resupply

If the land route through the Laotian Panhandle were successfully interdicted, the Communists would be forced to fall back on the sea route and the various routes through Cambodia in order to supply their forces in South Vietnam. Some use might be made of an airlift, although resort to such a procedure would be highly unlikely, considering US/GVN air superiority. However, if even two IL-14's could get through each night to airdrop supplies, they could deliver a total of nearly five tons per day.

The present external logistic requirement of 12 tons per day probably could be satisfied by the use of the sea route, the various routes through Cambodia, and an occasional airdrop. If only one or two small junks per day were able to evade the Market Time blockade, at least half the requirement could be fulfilled. The remainder would have to come from or through Cambodia or by air. Through a combined use of normal commercial channels and clandestine means the Communists could procure and move moderate amounts of supplies through Cambodia. However, it is doubtful that, through clandestine means alone, they could move, on a sustained basis, the entire 12 tons of military supplies needed daily by the VC/PAVN forces in South Vietnam. This doubt arises principally from the fact that illicit traffic of this volume could hardly clear the port of Sihanoukville without detection. If the 12 tons could actually be landed at Sihanoukville or other points along the coast, however, the Communists could undoubtedly move them forward into South Vietnam. At a minimum, the ability of the Communists to

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move goods clandestinely through Cambodia would be sufficient to provide an important adjunct to infiltration of supplies by sea.

The external logistic requirement of 65 tons per day for the present force fighting once in every seven days would be almost impossible to fulfill without use of the land route through Laos unless the Cambodian Government were openly to permit the use of its territory to support Communist military activities in South Vietnam. This is even more obvious in the case of the 170-ton logistic requirement for an increased force fighting once in every three days. As pointed out previously, the Communists would have to be prepared to face substantial losses if they attempted to bring in large tonnages by sea on a regular basis. They might succeed in this endeavor for a few weeks, but in the long run the attrition rate would be so high that the costs would probably prove to be prohibitive.

Although the capability of the supply system through Cambodia is more than seven times the maximum projection of 170 tons of daily external logistic support, this capability could be used only if the Cambodians ^{overly abandoned their neutralist policies in order} ~~entered the war directly on the~~ ^{to support} ~~side of~~ the Communists. Even if this happened, the capability of VC/PAVN forces to wage war in the central highlands of South Vietnam might be affected measurably by the cutting off of the Panhandle route, because ~~it has generally been~~ ^{believed that} the central highlands area is more easily and directly supplied through Laos.

On balance it does not seem likely that Cambodia ^{will} ~~is apt to~~ come out openly in support of the Viet Cong. Prince Sihanouk has been particularly

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sensitive to allegations that the Viet Cong are receiving weapons from Cambodia.

Late in 1965, for example, Sihanouk asked the International Control Commission to institute control procedures in the port of Sihanoukville, because of press reports concerning possible use of the port by the Communists. Other factors militating against a significant expansion of Communist supply operations through Cambodia include: (1) the fact that the Communists would have to get Sihanouk's support to open Cambodia^{ports}, and it is extremely doubtful that he would risk retaliation by such out-and-out cooperation and (2) the Communists themselves would^{hesitate} be ~~hesitant~~ to establish a major supply route which would have to depend on Sihanouk, whom they undoubtedly consider on the basis of past performance to be thoroughly unreliable.

Recent information has indicated increased use of Cambodian territory by the Communists, particularly in the extreme northeast salient of the country. Large numbers of Viet Cong troops have been reported in the Lomphat area and aerial photographs have shown numerous trails along the border area from the general vicinity of Camp Le Rolland north to route 19, which are believed to indicate Viet Cong activity. PAVN personnel have reportedly infiltrated through this area of Cambodia and some supplies have reportedly been carried from a warehouse on the Cambodian side of the ~~border~~^{border} near route 19 to the Pleiku area in South Vietnam. It was reported that during a 15-day period nearly 150 short tons were moved to the Viet Cong forces, or about 10 tons per day. This is the largest supply movement that has been reported taking place recently from across the Cambodian

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border over any sustained period of time, but it is considerably less than the 65 tons per day that would be needed by the present force under an escalated level of combat.

The inescapable conclusion seems to be that the Communists in South Vietnam would be cut off from external logistic support of more than 12 to 20 tons per day if the route through the Laotian Panhandle were blocked, unless Cambodia came out actively and openly in their behalf. We believe that the latter contingency is unlikely to occur. It should be kept in mind, however, that even with 12 to 20 tons a day flowing in by the sea route and clandestinely through Cambodia, the Communists could maintain their present level of activity, could step up the firepower of their forces, and could even increase their present force by as much as 40 percent provided the level of fighting remained approximately at its present level.

Furthermore, it is highly improbable that complete interdiction of the Panhandle road system could be achieved by air attack alone. Even with so-called successful interdiction, road capacities are probably reduced by no more than two-thirds for short periods of time, and a reduction of one-third over a longer period is about all that can be hoped for. Even where it is impossible to get through traffic moving again in a short period of time porters can be used to move supplies around interdicted points and for longer hauls if necessary. Even if all road traffic through Laos were brought to a halt small amounts of supplies could still be infiltrated by use of porters, bicycles, carts, and pack animals using trails largely invisible from the air.

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